

Mobility of Herds under Contract: A Study of Herd Distribution in the Far North Region of Cameroon.

Research Thesis

By

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ABSTRACT

Pastoralism, the practice of raising herd animals, is a wide spread phenomena in sub-Saharan Africa. It is an important economic sector in Cameroon, located in West-Central Africa. There are many forms of herding present in Cameroon, in this study two forms of herd ownership are examined in length. The two types of herd ownership are subsistence herds (independent) and absentee owned herds (under contract). Subsistence herds are owned and maintained by a family or an individual, while absentee owned herds are owned by one party and looked after by another. In the last decades there has been a shift in animal ownership across sub-Saharan Africa from independent ownership to absentee ownership. Prior research on pastoralism suggests that the mobility of absentee owned herds is reduced compared to their independent counterparts and that this lack of mobility has negative consequences for the state of rangelands. This study examines these claims using a combination of spatial and statistical analysis of pastoral mobility data and remote sensing data. Examination of the data indicates that the hired herds are no less mobile than the independent herds, and there are few differences in the distribution of contract and subsistence herds. Thus the preliminary findings suggest that the increase in absentee ownership is not affecting the movement of herds in the Far North Region of Cameroon.

SUMMARY

The purpose of this study is to examine the different mobility and distribution pattern of animals under contract compared to independently-owned animals. To do this, vegetation indexes, distances traveled, distribution, and duration of stay at transhumance locations are analyzed. This study has implications for the political ecology of pastoral systems.

INTRODUCTION

The mobility of herders in Africa is essential to the continuation of pastoralism. Transhumance is the annual movement of herds between rangelands. This process allows the vegetation to regrow, and is necessary due to the changing weather from dry to rainy season. It has been argued that transhumance mobility is decreasing and this decrease is affecting many aspects of the pastoralist's way of life (Bassett 1994).

During the last four decades there has been a shift in herd ownership away from the traditional herding practices of an individual owning their own herds, toward absentee ownership (Bassett 1994, Little 1985, Moritz et al. 2011). Absentee ownership is when a herd is owned by one person but given to another to be cared for throughout the year. The owners of these herds are referred to as absentee owners while the care giver, generally a pastoralist, is referred to as a 'hired herder'. The trend towards absentee ownership arguably increased due to recurring droughts (Bovin 1990, White 1990, Fratkin 1990). These droughts caused many poor pastoralists to be forced to sell their animals at very low prices, mainly to investors and other wealthy pastoralists (Bassett 1994, Bonfiglioli 1985). This increasing prevalence of absentee ownership is predicted to continue throughout Africa as population increases and economic growth both augment demand for meat production, as well as a desire for a reliable investment opportunity continues.

There have been many studies done on the socio-economic impacts of the relationship between absentee ownership and hired herders and the negative impact this has on rangeland management, but no studies on the annual mobility of herds under contract (Bonfiglioli 1985, Bovin 1990, Moritz et al 2010, Fratkin 1990). Previous studies have indicated a negative social

relationship between absentee owners and hired herders (Barth 1961, White 1990, Turner 2008, Black 1972, Bradburd 1980). In many of these studies the negative relationship between absentee owners and hired herders is assumed to also encompass reduced mobility for herds under contract (Bassett 1994, Toulmin 1992). Previous authors have stated that herds under contract are less mobile (Bassett 1994, Toulmin 1992). This claim has been attributed to many circumstances such as; the herders not being driven to work as hard (Beck 1980), the herders not being motivated to find the best locations because the herds are not their own (Bonfiglioli 1985), and the absentee owners restricting the movement of the herds because they want the herds to be readily available to be checked on (Bassett 1994). .

A change in mobility patterns would have a negative impact on rangeland movement and herd distribution. This study will analyze the relationship between absentee ownership and mobility of herds under contract in the Far North Region of Cameroon.

Five hypotheses are laid out to examine herd distribution and mobility.

Distribution:

- 1) Herds with more animals under contract will be located in areas with better vegetation because of the power of the absentee owners. This would imply that the rangeland is not open access and the social power of the herder effects the location of their herds.
- 2) The herds with more animals under contact will be located near the market village of Mazera because it provides easy access to the herds for absentee owners.

- 3) During the rainy season the herds with more animals under contract will cluster around the absentee owner's residence. In past research it has been stated that absentee owners insist that their herds stay in a close proximity to the absentee owner's location (Bassett 1994).

Mobility:

- 4) The herds with more animals under contract will travel shorter distances annually so that the absentee owners can more easily visit the herds.
- 5) The herds with more animals under contract will rest at the dry season camp locations longer, making them less mobile and easier to visit.

POPULATION AND STUDY AREA

This research project's study area was located in the Far North Region of Cameroon, located in West-Central Africa. Mobile pastoralists herding zones were examined in the study area which was delimited by the herder's typical transhumance patterns. Therefore, the study area was bounded around the Logone Floodplain. This study area has two distinct seasons, the rainy season, which lasts from June until September and the dry season, which lasts from October to May. The changing of seasons causes the mobile pastoralists to go on transhumance to find the best vegetation for their herds. Due to this, during the rainy season the herds are located in the Diamaré Plains, and during the dry season they are located in the Logone Floodplain.

The pastoralists in this study are all mobile herders that go on transhumance in the Far North Region of Cameroon. These pastoralists were of the Arab and FulBe ethnic groups. Data on these herders was collected for the months of February, May, August, and November for four years 2008-2012. In this data there are a proportionate number of hired herders and independent herders represented throughout the years.

METHODS

In the attempt to understand the mobility and distribution patterns of both absentee owned herds and independent herds an ethnographic study was conducted. Both structured interviews as well as GPS location tracking were employed to collect the data necessary for this study. The methods sections should be broken into two categories, data collection and data analysis.

Data Collection

The pastoralists included in this research operate in mobile units during their transhumance. Therefore, households stay together, generally owning or being hired to look after a few herds. These households then join together with other households to form camp groups that travel together throughout the year on the transhumance. Data concerning the camps and households was collected by Cameroonian research assistants, working for Centre d'Appui à la Recherche et au Pastoralisme (CARPA), for the five year study period (2008-2012). This data was collected by conducting a semi-structured interview with pastoralists in each of the camps, and included questions about the number of animals under contract, and independent animals, as well as the name of the household head.

An annual transhumance survey was conducted which collected more mobility data on all of the households participating in the study. This survey collected the names of the sites the pastoralists visited annually, as well as the number of days spent there for the past year.

Garmin GPS technology was also used to collect data for the study of the movement of the herds under contract and the independent herds. A GPS locator was used to mark out the longitude and latitude coordinates for each camp zone, this data was then used as a reference when the pastoralists indicated which camp zones they had visited throughout the year. The resulting data allows us to map the mobility patterns and movement of all the herds through the Logone Floodplain during the dry season (October-May) and the rainy season (June-September). In this GPS dataset, along with the coordinates, the camp leader, number of households, herd size and total number of animals were also documented.

For many households the number of herds under contract and independent herds were noted for some years and omitted for others. In these circumstances the average of the number of herds for each type of herding contract for each camp was calculated and used in place of the omitted data. It is also important to note that many households do not want to acknowledge that they have herds under contract as it is seen as a lower form of pastoralism than owning independent herds. Due to this there may be discrepancies between what the pastoralist said to the interviewer and the truth of their herd composition. In these cases it is impossible to verify the truth without spending extended periods of time with the herds, which was not possible for this study.

Data Analysis

Data analysis was conducted on all of the aforementioned collected data to evaluate the hypotheses. To begin, the pastoralist's households were combined into camp zones to create a more manageable sampling of data to analyze. To do this, ArcGIS was employed specifically using ArcMap to plot the locations of all pastoralists each year. On average the distance cattle travel daily to graze is 4.5 kilometers, but a buffer zone of 1.5km was placed around each of the pastoralists locations, because buffer distance represented the distance of the most intensive grazing zones for the cattle during a day (Moritz et al. 2010). Camp zones were created from the pastoralists whose 1.5km buffer zones overlapped. This overlap indicated that the pastoralist's herds interacted on a day to day basis, suggesting that the area of these overlapping buffer zones comprised a camp zone. Camp zones were created using this same method for all five of the study years (2008-2012). Using the vegetation index (NDVI) data from the LANDSAT satellite, it was possible to overlay the camp zones onto the vegetation data to see the relationship, again using ArcMap.

The location of the herds in relation to larger market villages was also important to this study. Utilizing the ability of ArcMap as a visual representation tool, the market village of Mazera was plotted in relation to all of the camp zone locations in the Logone Floodplain. Distance to Mazera was calculated using Google Earth technology's straightest path method from the coordinates of the herd location to the coordinates of Mazera. Each camp zone has multiple camps, and spans a few kilometers. To find the most accurate correlation each camp's distance was used instead of calculating distance from a camp zone.

The location of the herds during the rainy season and the dry season were documented in the annual transhumance survey. This study took the sample year of 2009-2010 to analyze the orbit distance traveled as well as the furthest distance travel, in an effort to distinguish the difference in mobility between herds under contract and independent herds. The distance between each movement was calculated using Microsoft Excel for each household during the 2010 study year. These distances were calculated using Pythagorean Theorem using UTM coordinates.

Microsoft Excel was used extensively as an analytical tool to find statistical correlation between the aspects of the data collected. Linear correlation was found for vegetation index and percentage animals under contract, distance to Mazera and percentage animals under contract, orbit distance and percentage animals under contract, furthest distance and percentage animals under contract and length of stay in the dry season location and percentage animals under contract. All of these statistics were calculated using excel formulas, and displayed visually using the scatter charts.

RESULTS

Distribution

Vegetation Index and Animals under Contract

This study found that for the five-year study period there was no consistent pattern of statistically significant correlations between the quality of vegetation and the location of the herds with more animals under contract. This result was obtained by overlaying the camp zone locations over the NDVI values and finding the average NDVI value per camp zone. The average NDVI value per camp was compared to the percentage of animals under contract present

in each camp zone, then the correlation was calculated. The map below shows this process for 2010, which has seven camp zones indicated by the blue overlapping buffer zones. These buffer zones are represented by graduated colors showing the percentage of animals under contract in each camp. The black points represent the location of each camp in the camp zone, and are graduated by size based on the total number of animals present at each camp. The grey scale squares behind the buffer zones represent the NDVI value and are graduated by color with white representing the highest NDVI and black representing the lowest NDVI. Finally the blue star in the North East quadrant represents the location of Mazera the village market where many absentee owners travel through to check on their herds.

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Map 1. Camp zones, Camps, NDVI values, percentage AUC, Total Animals, and Distance to Mazera (2010)

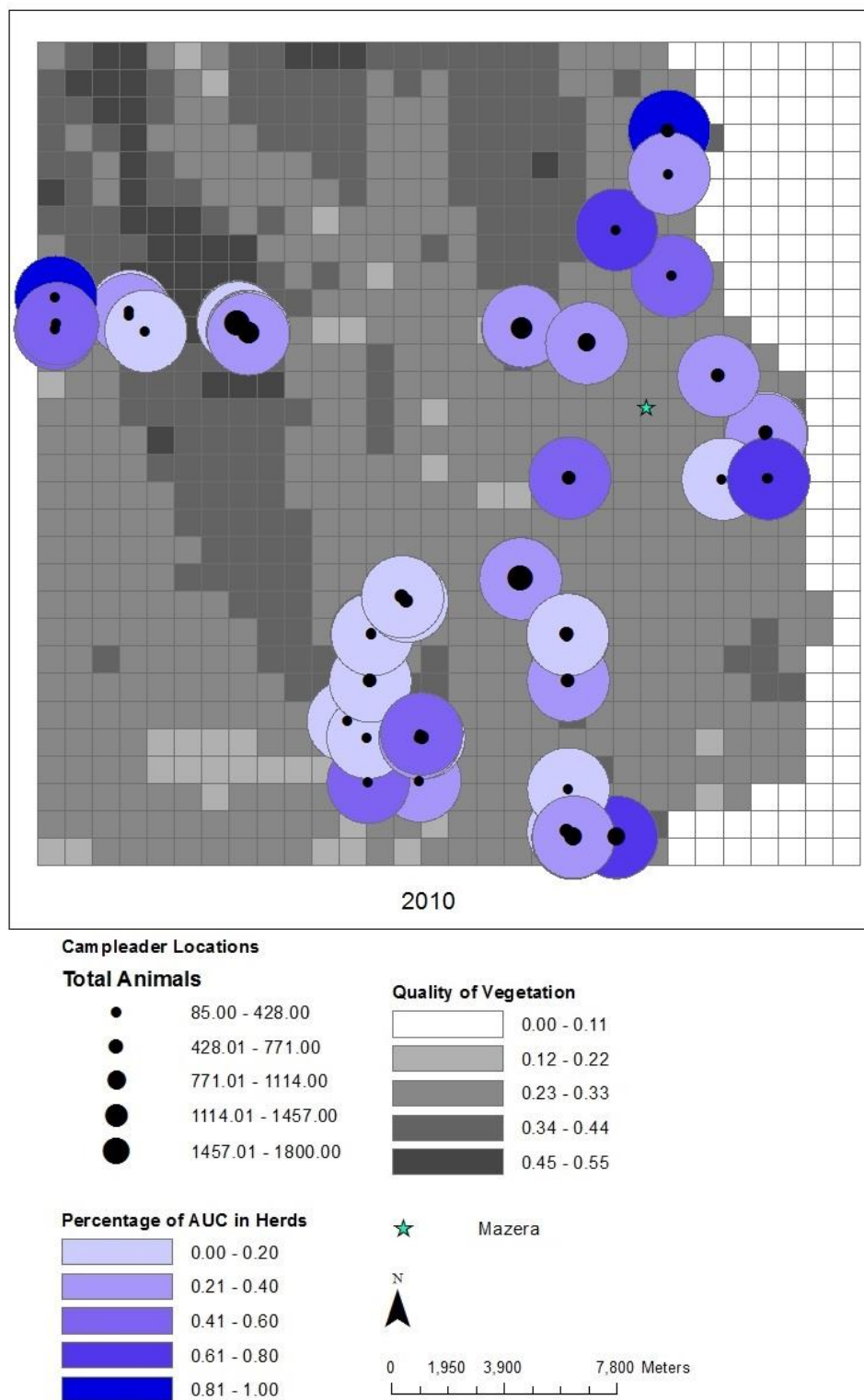


Table 1. The correlation between average NDVI value and percentage AUC each year (2008-2012). The r value in this table is the linear correlation value between average NDVI value and percentage animals under contract in each year; the N value is the number of cases corresponding to the number of households in each year, while the P value is the statistical value of r.

	Linear Correlation		
	r	N	P
2008	-0.7016	13	**0.0075
2009	-0.2237	11	0.5085
2010	0.0965	9	0.8000
2011	-0.6654	11	*0.0255
2012	-0.2333	10	0.5166

To be statistically significant the P value must be less than 0.05. It can be seen that there is statistically significant correlation in 2008 and 2011, this correlation is negative suggesting that the herds under contract during these years were located in areas with less optimal vegetation. However, overall there is no overall pattern of significant correlation therefore one cannot draw any conclusions.

Herds under Contract and Population Density

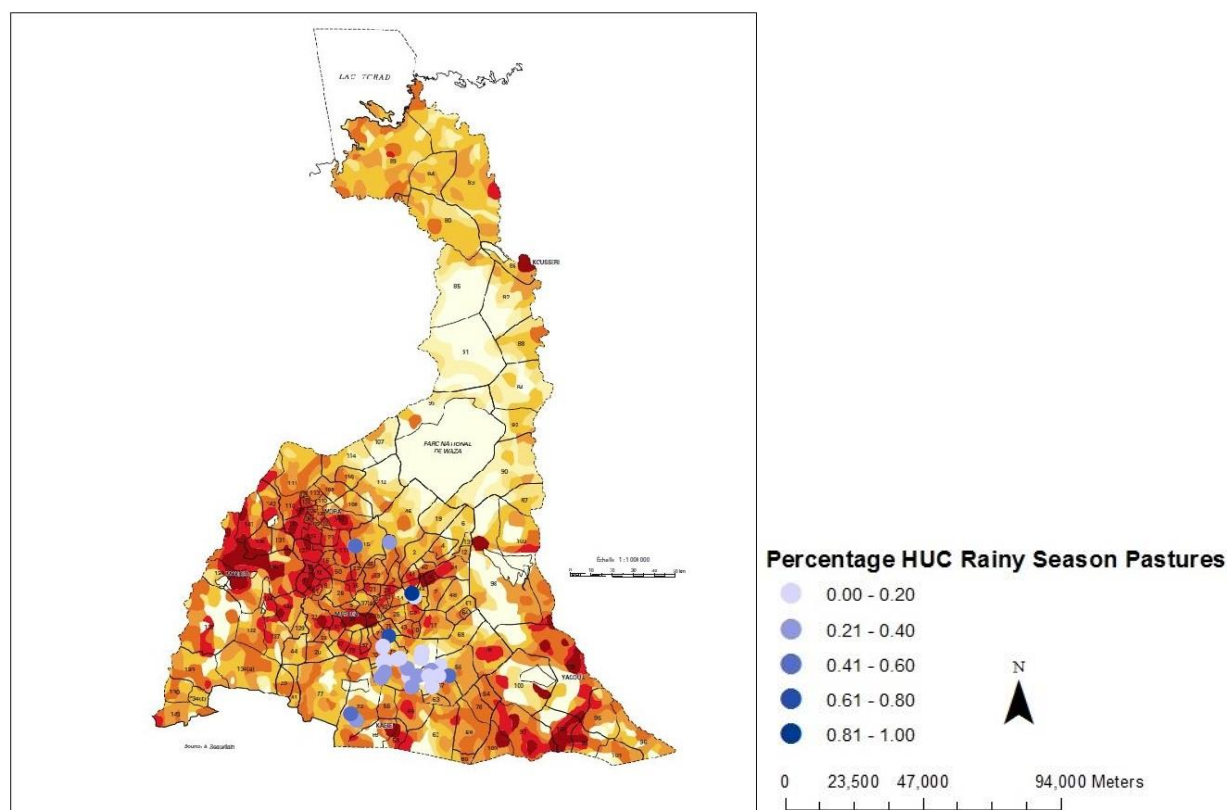
From the aforementioned results it was found that the herds under contract do not have different distribution patterns than those of independent herds during the dry season in the Logone floodplain. Although this is true, that does not mean that their distribution continues in the same manner during the rainy season when the herds travel south towards the more densely populated area of the Far North Region of Cameroon. Previous studies have indicated that hired herders keep their herds close to the herd's absentee owners (Bassett 1994, White 1990). This would cause a clustering effect around the populous cities in the South, as this is where the absentee owners are thought to reside. The best locations for vegetation are located away from

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the cities in less densely populated areas with fewer fields and thus more pastures. To study this distribution, 2010 was chosen as a sample study year as it provides a spread of animals under contract and independent animals and allowed the number of pastoralists to be manageable to analyze.

Therefore, the locations of the household's herds (2010) are plotted during the rainy season. The blue color gradient of the points indicates the percentage of animals under contract in each household while the white to red color gradient indicates the level of population density.

Map 2. Location of households during the rainy season and the percentage of AUC in each camp (2010). Map attained from Seignobos, Christian, and Olivier Iyébi-Mandjek, eds. 2000. Atlas de la Province Extrême-Nord Cameroun. Paris: IRD & MINREST.



The herds with fewer animals under contract are located further south than the herds with more animals under contract. The more southern location of these herds coincides with an area of

less population density and more vegetation, making it the better choice to settle with cattle herds. It was seen that the herds with a higher percentage of animals under contract settled for the rainy season in more Northern locations, nearer to areas with a high population density. These populous cities are the assumed location of the absentee owners, as there is no available data presently on the permanent locations of the absentee owners. If the assumed locations are correct, then it would seem that there is a clustering effect around the absentee owner's locations during the rainy season.

Distance to Mazera and Percentage of Animals under Contract

The clustering effect of herds under contract around the densely populated cities in the South of the Far North Region of Cameroon suggests that absentee owners may be dictating to the hired herder where to take their herds, and are disregarding the optimal wellbeing of the herd in preference of their convenience. Although this has been seen for the rainy season, there are far fewer densely populated cities in the Logone Floodplain. One of the largest village markets is Mazera, which attracts vendors and consumers from all over the region who travel to the market by bus. This village provides a perfect through town for absentee owners to travel from the village to their herds in the region. Due to this, it is expected that herds under contract would be located closer to Mazera than independent herds. Refer back to Map 1 to see the process of finding the distance from each camp zone to Mazera. Each black point is a camp, each camp's distance to Mazera was calculated and the statistical significant and correlation was found. The following chart compiles the results.

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Table 2. Correlation between the distance to Mazera and the percentage of animals under contract in each camp zone. The r value in this table is the linear correlation value between the distance to the market village of Mazera and percentage animals under contract in each year; the N value is the number of cases corresponding to the number of camps in each year, while the P value is the statistical value of r.

	Linear Correlation		
	r	N	P
2008	-0.2934	34	0.0921
2009	-0.2035	53	0.1439
2010	-0.2790	57	0.0356
2011	-0.1200	54	0.1471
2012	0.0463	57	0.7276

There is no pattern of statistical significance between the distance to Mazera from each household's location and the percentage of animals under contract found in those households. The distribution of herds under contract and independent herds in the Logone Flood Plain is random; there is no clustering around Mazera and subsequently the absentee owners. This follows the previously discussed results that the herds under contract are following the locations of the optimal vegetation in the same manner that the independent herds are..

Mobility

Duration of Settlement in Dry Season Location

The analysis of the locations of herds under contract during the dry season dispelled any notions that the absentee owners affected the distribution of their herds in the Logone Flood Plain, but there was still the possibility that herds under contract had altered mobility patterns than their independent herd counterparts. The duration of settlement in the dry season locations were analyzed in an attempt to distinguish whether day-to-day mobility of herds under contract differentiated from independent herds.

Table 3. Correlation between duration of stay in dry season location and percentage animals under contract (2010). The r value in this table is the linear correlation value between the duration of stay in the dry season location and percentage animals under contract in 2010; the N value is the number of cases corresponding to the number of camps in 2010, while the P value is the statistical value of r.

	Linear Correlation		
	r	N	P
2010	0.1941	84	0.0769

There is no statistically significant correlation between the duration spent at the dry season location and the percentage of animals under contract. This again suggests that the herds with more animals under contract are traveling and distributing in the same manner as the herds with more independently owned animals.

Distance Traveled from Rainy to Dry Season Locations

The furthest distance traveled during the annual transhumance is from the rainy season camp to the dry season camp. This transition is never done in one movement, but many as there are typically about seven camp locations between the rainy and dry season camps. In previous studies it has been argued that hired herders are less mobile, therefore it would follow that the furthest distance traveled would be shorter for the herds under contract than the independent herds. To test this hypothesis, the furthest distance traveled for each camp leader was calculated in the sample year 2010.

Table 4. Correlation between distance traveled from rainy to dry season locations and percentage animals under contract in each household (2010). The r value in this table is the linear correlation value between the distance traveled from the rainy to dry season camps and percentage animals under contract in 2010; the N value is the number of cases corresponding to the number of camp leader in 2010, while the P value is the statistical value of r.

	Linear Correlation		
	r	N	P
2010	0.2769	85	**0.0094

It was found that there is significant correlation, but correlating in the opposite manner than what we had expected. We had thought that hired herders were less mobile; therefore if there was a significant correlation it would be negative. As the chart above shows there is positive correlation, the further the distance is from rainy to the dry season camps the larger the percentage of herds under contract in that household. It is unclear why this result occurred. The r value is low indicating a weak correlation although the P value is still highly significant. These results would have to be further examined, which exceeds the scope of this research, to be able to draw a conclusion.

Orbit Distance of Transhumance

Ultimately the day-to-day mobility of the two types of herds is much less significant than the overall mobility of the herds throughout the annual transhumance. The total orbit distance of the herds indicates whether the total area of the pasture is being utilized by both types of herds, or if the mobility of herds under contract is diminished. The annual transhumance survey was used to find the locations of the household and the duration of their stay at each location. Below is a sample of one household, Abba Goni, in 2010 and its orbit throughout the year. 85 households were sampled.

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Map 3. Complete orbit of Baaba Dowi in 2010 including location of camps, and duration spent at each camp.

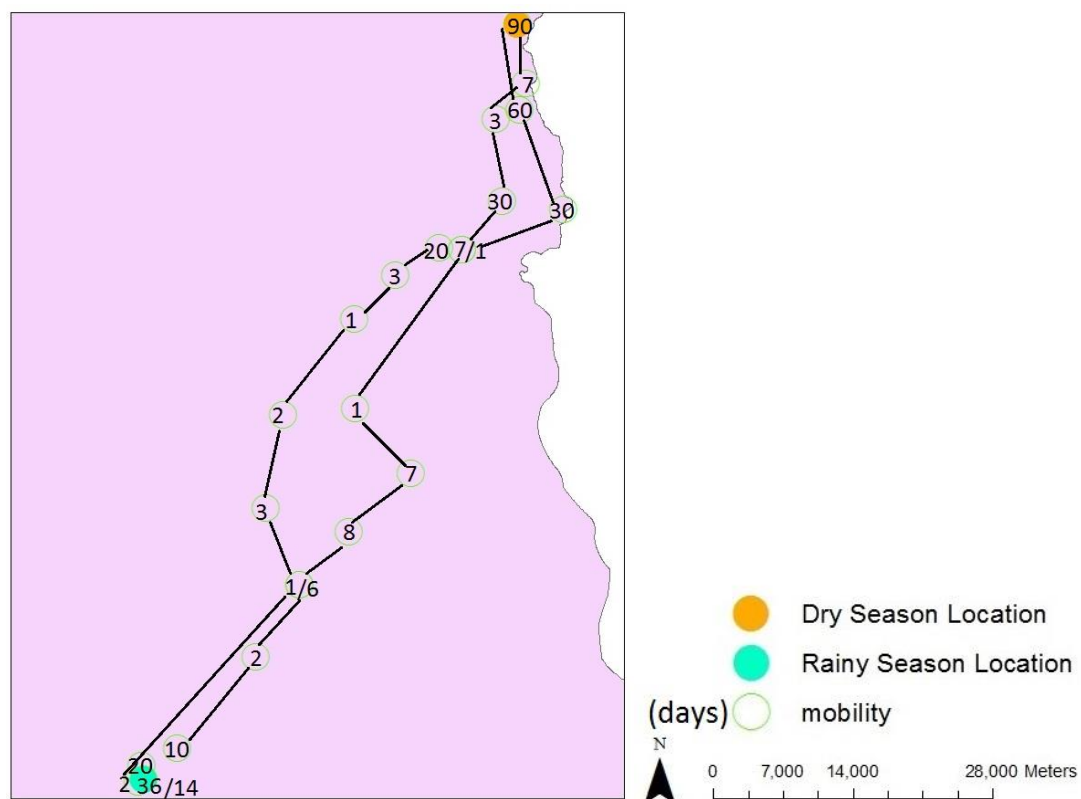


Table 5. Correlation between total distance traveled and percentage animals under contract in 2010. The r value in this table is the linear correlation value between the total distance traveled and percentage animals under contract in 2010; the N value is the number of cases corresponding to the number of camp leaders in each year, while the P value is the statistical value of r.

	Linear Correlation		
	r	N	P
2010	0.0292	85	0.7906

There was no statistically significant correlation found between total orbit distance and percentage animals under contract per household. Herds under contract are as mobile as independent herds throughout the year; therefore there is no decrease in mobility based on the type of herding contract.

CONTRIBUTIONS

The impact of this study on the current understanding of herding in Cameroon is valuable. It is clear from this study that mobility of absentee owned herds is not impacted as much as was previously thought. Although this research increases the knowledge base of hired herding and herds under contract in the Far North Region of Cameroon, the results were contradictory at times. No future policy should be drawn solely from this research at this time.

This study utilized many methods of data collection and analysis to come to its final results. This allowed the data collected to be thorough enough to draw conclusions about five years of transhumance movements. The GPS data provided latitude and longitude points of each of the households throughout the year. The GPS data was then cross checked by the annual transhumance data collected, as each of the household were asked to name all of the sites they visited and their locations throughout the year. The two systems (GPS and transhumance) cross checked each other and allowed the data used in this study to be more reliable. Also, the first hand collection of data through both the annual transhumance survey and the household data ensured the most accurate data was collected for that time period.

The data collected for this research spanned five years and was collected for four months each year, allowing variations and patterns in the datasets to emerge. This allowed research to be conducted on the correlation of different aspects of the data over the years. Although, only one sample year was analyzed in this study for the mobility data, it would be valuable to examine the five years collectively to distinguish any recurring patterns of mobility.

This study could be improved in the future with more data collection and data analysis. A study of this region of Cameroon is limited in many cases to the data that the researcher can

collect first hand, as it is remote and little documentation is conducted. Therefore, there were aspects of this research that could have been improved if there was more readily available data. Specifically, the analysis of the absentee owners could have been improved had the locations, ethnicities, backgrounds, and frequency of visits to the herds. Also, much of the data that was used was extrapolated from many different surveys and reports. This led to the data having a lower confidence value than if it had been collected first hand and the researcher knew it was completely reliable. To resolve the inconclusive nature of this study it is essential to collect more data in an effort to further understand the causality of the correlations found. There are many avenues that this research can venture down at this point. This report is a preliminary investigation into the mobility analysis of hired herders, but the impact of this research is far reaching.

If the data was available this research could be improved by looking at the distinction between absentee owners who are currently pastoralists, absentee owners who were former pastoralists and absentee owners who have no previous experience with pastoralism. It would be valuable to decipher if there are any mobility or distribution changes within the absentee owner group itself. Also, another analysis that could be added to this research is to look at the distinctions between hired herders. There are different types of contracts available to hired herders. Mainly the herder is either paid a wage, given some cattle or allowed to keep the milk that is produced. This research would be augmented by the analysis of mobility patterns within the types of absentee owners and hired herders. Combining the categories into two distinct groups may cause some important patterns to be overlooked.

CONCLUSION

Herds with more animals under contract have the same mobility patterns as those with more independently-owned animals. There is no statistically significant results present in this research that differentiates the mobility patterns of herds under contract and independent herds. This indicated that the data used in this research does not support the previous research which states that hired herders are less mobile (Bassett 1994, Toulmin 1992). This being said, the notion that herds with more animals under contract congregate around the large villages to be available to absentee owners is correct during the rainy season. The herds with more animals under contract cluster around more densely populated areas compared to herds with more independent animals. This supports the claims of previous studies which argued that absentee owners are a pull factor and this clustering may adversely affect the rangeland causing overgrazing (Bassett 1994).

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